DOCUMENT RESUME

ED 417 881 RC 021 435

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TITLE Developing Interactive Multimedia Modules To Train Rural Special Education Personnel.
PUB DATE 1998-03-00
NOTE 9p.; In: Coming Together: Preparing for Rural Special Education in the 21st Century. Conference Proceedings of the American Council on Rural Special Education (18th, Charleston, SC, March 25-28, 1998); see RC 021 434.
PUB TYPE Reports - Descriptive (141) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Computer Assisted Instruction; Higher Education; *Learning Modules; *Material Development; Multimedia Instruction; *Multimedia Materials; Practicum Supervision; Rural Education; Special Education; Special Education Teachers; *Teacher Educator Education
IDENTIFIERS *Interactive Multimedia; West Virginia University

ABSTRACT

Multimedia instructional materials represent an important resource for teacher education programs in special education. They enable prospective special educators to observe and study important aspects of professional practice without the time and expense of actual field experiences. Multimedia materials can be a form of anchored instruction or situated learning to help learners relate theory to practice and form useful concepts of important principles. Computer-assisted multimedia is especially appropriate for the design of self-instructional modules. To date, there have been few applications of multimedia for teacher education in special education. Recent innovations in desktop software applications, however, have simplified the development and programming of original multimedia modules tailored by instructors for their own specific instructional uses. At West Virginia University, a development team consisting of a faculty member with content expertise in supervision of special education practicum experiences, a doctoral student with a background in special education and instructional technology, and a video producer with experience in digital video media worked together to develop a series of self-instructional multimedia modules to prepare coordinating teachers and university supervisors for their roles in supervising rural practicum experiences. This paper reports on the development process and the final product. Sections discuss the rationale for multimedia instruction, development of module content and activities, preparation of video and audio segments, and use of desktop computers for multimedia development and production. Contains 47 references. (Author/SV)

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DEVELOPING INTERACTIVE MULTIMEDIA MODULES TO TRAIN RURAL SPECIAL EDUCATION PERSONNEL

Introduction

Educators have recognized the importance of multimedia instructional materials to portray the dimensions of the real world and accommodate the many learning styles exhibited by diverse learners. Multimedia materials have been recommended as one form of anchored instruction or situated learning to help learners relate theory to practice and form useful concepts of important principles. Computer-assisted multimedia is especially appropriate for the design of self-instructional modules, since the computer allows for learner interaction. Nevertheless, most existing materials have been developed in content areas rather than for professional training. To date, there have been relatively few applications of multimedia in teacher education in special education. Recent innovations in desktop software applications, however, have simplified the development and programming of original multimedia modules tailored by instructors for their own specific instructional uses. But, multimedia development requires expertise in instructional content/design, media production, and computer programming. At West Virginia University, a development team consisting of a faculty member with content expertise in supervision of special education practicum experiences, a doctoral student with a background in special education and instructional technology, and a video producer with experience in digital video media worked together to develop a series of self-instructional multimedia modules to prepare cooperating teachers and university supervisors for their roles in supervising practicum experiences in rural areas. Their account of the development process and the final product of their efforts may be useful in inducing faculty at other colleges and universities to consider developing multimedia applications that may be appropriate in their own rural personnel preparation programs in special education.

Rationale for Multimedia Instruction

In recent years, instructors at many colleges and universities have turned to the use of multimedia materials to portray for students the dimensions of the real world of the classroom (Goldman & Barron, 1990; Todd, 1993; Willis & Meblinger, 1996). Multimedia portrayals of classroom scenes and teaching episodes have been recommended as one form of anchored instruction or situated learning (Bransford, Sherwood, Hasselbring, Kinzer, & Williams, 1990; Brown, Collins & Druguid, 1989; CTG-VLTC, 1993; Lave & Wenger, 1991). The recent revolution in media production via desktop computers has made the creation of original materials integrated into mulimedia applications tailored by the instructors for their own specific uses a reality (Howes & Pettengill, 1993; Richards, Chignell, & Lacy, 1990; Wagner, 1996). Multimedia hold promise for creating "virtual classrooms" which will enable learners to have access to many resources that previously were unavailable. Unfortunately, few instructors have acquired the knowledge or skills to plan and produce original media materials and they may not know how to learn more about this field. Yet, desktop production of media modules that include video, audio and graphics is neither difficult nor beyond the ability of most instructors. Designing, producing, and using original multimedia materials in instruction are skills that can easily be acquired with some basic instruction and reference to a few simple guidelines.

Computer-assisted instruction has been an important component of teacher education in special education for over a decade (Cartwright, 1984; Blackhurst & McArthur, 1986; Rieth et al., 1993). More recently, use of multimedia modules for instruction has been found to be especially effective in promoting development of new clinical knowledge and skills through creating

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structures for situated learning of current best practices (Bosworth & Welsh, 1992; Chen, 1993; Luna & McKenzie, 1997; Overbaugh, 1994), as well as appropriate for providing learners with opportunities for reflection, problem solving, and practical application with feedback (Goldman & Barron, 1990; Lave & Weger, 1991; Todd, 1993). Interactive modules using computer programs to control videodiscs have already been used to train teachers as behavior managers (Strang, Murphy, Kauffman, Badt, & Loper, 1986), early intervention personnel (Macy, Klapprodt, Hammer, & Macy, 1987), paraprofessionals (Salzberg, Rule, Chen, Fodor-Davis, Morgan, & Schulze, 1989); behavior disorders specialists (Fitzgerald, Wilson, & Semrau, 1996), and assistive technology providers (Thorkildsen & Lowry, 1997). The use of multimedia to demonstrate programs and practices is not only cost-effective, but even essential to developing the kind of knowledge and skills that special education personnel need to function well in their demanding and ever changing roles in providing high quality educational programming to students with special needs.

Multimedia development is no longer the exclusive domain of the wealthy or the technically sophisticated. The recent revolution in digital media and its incorporation into computer hardware and software applications for the desktop has made multimedia design and production accessible to the average user (Fidler, 1997). The availability of inexpensive computer software and hardware has made the creation of original video materials integrated into multimedia applications tailored by the instructors for their own specific uses a new outlet for course development and scholarly productivity (Azarmsa, 1996). Instructors who now use their computers via word processing and database programs primarily to design print or text-based materials, will soon find new uses for their desktop systems to create video materials for display in their classes via tape or disk formats. Although it is possible for a single person to do all the work for a multimedia project, it is more reasonable to assemble a team of people with different areas of expertise to collaborate in the design and production of multimedia materials to insure an appropriate balance of instructional effectiveness, production values, and aesthetic qualities (Alber, 1996; Maddux, 1994). New authoring software programs, which enable program designers to incorporate text, graphics, and video with ease, have made the creation of modules a real possibility for the average instructor who is willing to take the time and effort to learn some new skills and to collaborate with others ----.

Colleges and universities with teacher education programs in special education that prepare teachers and related service personnel to work in rural areas need to use instructional materials that depict program models, methods, and materials that have been successful in rural schools. The simplest and most straightforward use of multimedia materials is to provide students with illustrations of basic concepts, demonstrations of specific skills, or examples of model programs and practices, through presentation of either real world situations or simulations. These materials also can be used as contextually rich case studies to stimulate student discussion of issues and/or application of knowledge and skills. Such materials can be invaluable aids in helping preservice and inservice teachers to acquire important knowledge and skills for working in rural settings. Yet, most of the media and materials that are widely available represent program models from urban and suburban areas that may or may not be appropriate for or feasible in rural schools. This situation means that many faculty will see a need to create original multimedia materials that can be used in to deliver and support instruction in the context of rural teacher education programs. Faculty and staff at West Virginia University recognized a need for to a series of self-instructional modules to assist cooperating teachers and supervisors to acquire appropriate skills for conducting practicum experiences in special education at the undergraduate and undergraduate levels in rural skills. Consequently, they formed a team to develop and produce a multimedia project.

Developing Module Content and Activities

West Virginia University offers teacher education programs in special education at both the undergraduate and graduate levels that includes a range of practicum experiences including placement with a master teacher as well as peer supervision in the job setting. Recognizing the importance of practicum experiences for the development of teaching skills and the critical role of supervisory personnel (Buck, Morsink, Griffin, & Lenk, 1992), the program has made every

effort to select qualified supervisors and prepare them for their roles. The size of the WVU service area across the state combined with the high attrition rates of special education personnel in rural areas has created a situation in which the program experiences constant turnover of supervisory personnel and a continuing need to train new cooperating teachers and university supervisors. Although the program has offered training sessions for new supervisors, time and travel constraints prevent many individuals from attending these sessions before they are called upon to supervise a practicum experience. The practicum coordinator recognized the potential of multimedia modules for use as a self-study training format that could be delivered to new supervisors on an individual, as needed basis.

The faculty instructor developed the content and instructional design for the multimedia modules from the existing practicum model in special education at West Virginia University, which is based on the philosophy and techniques of clinical supervision (Glickman, Gordon, & Ross-Gordon, 1997). The instructor reviewed the practicum handbook, the supervisor manual, and the supervisor training sessions handoutrs and activities to identify topics to be included in the modules. She organized this content into four component modules: overview of supervision; strategies for observation/documentation; strategies for fedback; and, strategies for evaluation. Using principles of effective instructional design (Dick & Carey, 1996), she outlined learner outcomes as well as learning activities for each component. Effective computer-based instruction uses a logical sequence to represent the particular knowledge structures (Hannum, 1988), and reflects a presentation -- demonstration -- practice -- feedback cycle (Criswell, 1989). Therefore, each module was designed to include three types of content: text presentations (such as definitions of key terms, explanations and examples of principles and practices); media presentations (such as video clips of supervision activities and audio clips of interviews with supervisors), and practice/assessment activities.

Another important step in creating original multimedia materials is preparing a script or flowchart to guide the development process (Korolenko, 1997; Sauer, 1997). The instructor developed a set of design specifications for each screen, which included three key features: a basic layout representing the approximate size and shape of the computer screen; conventions for displaying content, such as text, audio, video, and graphics; and, link notations, including the type of link as well as its appearance and location on the screen. Using these guidelines, she prepared by hand a series of graphic representations of all screens, printing and drawing the content and using different color inks for content features, directions to the programmer, and queries about the layout. Since each module had to be entirely contained within a single CDROM disk with a maximum storage capacity of 650 megabytes, the team worked together to determine storage requirements for different content types to estimate the amount of information that would fit. They identified several planning factors: text requires minimal space; a photo graphic requires 300 to 500 kilobytes of storage for black and white image and 700 to 1000 kilobytes for color image; a 20 second audio clip requires 70 to 100 kilobytes of storage; and a 30 second video clip at 15 frames per second compression rate requires some 20 to 25 megabytes of storage.

Preparing the Video and Audio Segments

Video and audio are effective instructional media when their unique capabilities are highlighted (Baggett, 1989; Cartwright, 1991; Kozma, 1991). The faculty instructor designed the video and audio segments for the multimedia modules based upon specific topics identified during content development. Video segments are most effectively used to demonstrate action sequences; therefore, the instructor determined that video segments should focus on supervison skills associated with each module component (e.g., in the feedback component, segments were planned to show effective and ineffective verbal exchanges). Audio segments are most effectively used to convey personal perspectives, so audio segments were planned to convey interviews with supervisors discussing critical aspects of supervision in their own words (e.g., in the feedback component, interviews offered comments on dealing with difficult situations and reasons why feeddback is an important component of effective supervision).

After the instructor determined the video scenes and interview clips that were needed to illustated the content in the modules, she arranged for experienced supervisory personnel to assist in the production of these segments. She scheduled the shoots at an appropriate location and time and distributed information to participants to help them prepare for their roles. All supervisors were asked to prepare 20 to 30 secon9d sound bites based on their personal experiences in response to a series of questions on key opportunities and challenges in supervision. The instructor worded these questions as open-ended statements such as "The hardest part of supervision is -----" or "I handle a difficult student by -----". The questions were worded slightly differently for each participant to insure that their comments would vary to some extent. Some supervisors also were asked to serve as actors in role play scenarios developed to depict situations typically encountered during supervision and to portray appropriate and inappropriate responses. The instructor provided role play participants with a description of the specific behaviors to be demonstrated in the 60 to 90 second scenario, but the actors developed their own context and interactions to keep a lively feel. The instructor briefly reviewed the interview responses and role play plans with the participants just prior to the videotape recording to insure that theese activities would meet the content requirements of the modules.

This project utilized Sony Betacam SP professional quality videotaping equipment to insure the highest quality images. The video producer was responsible for recording, editing, and digitizing these segments for the multimedia modules, in collaboration with the faculty instructor as content expert and the technology assistant as computer programmer. On the day of each shoot, the producer set up the camera in the selected location and arranged the setting to minimize irrelevant stimuli such as distracting backgrounds or external noises. He used a professional three-light kit to insure that the subjects were well-lit and that the foreground figures were separated from the background. He also used lavalier microphones clipped to the subjects' clothing to insure the highest fidelity speech sound and to limit interference from room noises (Tanaka, 1997). For all video and audio segments, he planned a sequence of shots following recommendations for video to be compressed and played back on desktop computers (Thibodeau, 1997). For the interviews, he used a tight shot of the supervisor from the side as she or he responded to the questions and prompts provided by the instructor (but the instructor did not appear on camera). For the role plays, he first used a wide shot of both actors performing the entire scenario; he then used a tight shot of each actor repeating the entire scenario. This technique allowed the finished segment to be composed of an edited sequence of closeups and wide shots for a more interesting display than the use of wide shots alone.

After all necessary footage was recorded for each module, the producer digitized the tape for editing and incorporation into the interactive formats, following compression guidelines for maximizing image quality while minimizing file sizes (Shaw, 1996; Volkow, 1997). He connected the Beta SP videotape recorder to a Macintosh 8600 computer with a built-in AV board to capture the video and audio segments. The segments were imported into Adobe Premiere for editing. Each segment was opened and closed with a freezeframe so that the opening shot could be displayed on the screen prior and subsequent to playing the entire segment. For the interview segments, he trimmed the audio clips so that the person's statement would begin and end clearly. For the role play segments, he laid down the wide shot version, then edited in the closup versions of each actor as needed to portray the main action. When the editing was finished, the producer made movies in Apple's Quicktime and put them in a bin for later use by the programmer in assembling the modules.

Using Desktop Computers for Multimedia Development and Production

Effective multimedia materials capitalize on the computer's capacity for interaction with the learner as well as the availability of software that simplifies programming chores (Moore, 1994; Myers & Burton, 1994). The technology assistant was responsible for programming all components of the multimedia modules. This project used an Apple Power Macintosh 8600 computer with AV configuration for development and production because of its reasonable cost and ease of use. This computer platform has a factory-installed video and audio input and output board as well as

sufficient speed and memory to manipulate large files. Project staff used two types of external storage devices to store raw video and audio clips, edited segments, and completed interactive formats: an Iomega Zip drive and cartridges with 100 megabyte capacity as well as an Iomega Jaz drive and cartridges with 1 gigabyte capacity.

Macromedia Director 6.0 was used as the authoring program for the multimedia modules because of its comprehensive features and superior interactive capabilities (Roberts, 1995). The programmer began by thoroughly learning the elements and processes unique to Director and using them to design prototype screens for review by the development team. He identified backgrounds, text, digitized pictures, sounds and video clips to be used as cast members. Cast members represented all elements of the modules that will appear either directly on screen or in the program on screen. For example, a single screen might have several cast members: a title, a narrative, a graphic, an animation, and a video clip. He also incorporated material prepared in other programs such as Adobe Photoshop for use as cast members (Abrams, 1996). He used the score feature of the application to control the sequence of events by which cast members appeared in the modules. For example, in the opening sequence, several photographs pop on screen accompanied by the simultaneous sound of a camera shutter. He then assembled the module screens prepared by the faculty instructor and the audio and video segments prepared by the video producer for incorporation into the multimedia modules. He used the Lingo scripting function to write simple subprograms to operate the interactive formats for practice and assessment activities. He designed a set of navigation aids, including buttons and rollovers, using familiar metaphors such as highlighted hypertext and arrows to assist the learners in controlling their progress through the module (Marra, 1996; Dunlap, 1996).

When the development team assessed the initial programming of the modules and considered the comments of other professional reviewers, they decided that the content and interactive formats of the modules more than met their expectations and represented effective instruction, but they were concerned about the aesthetic quality of the appearance of the module screens. Recognizing that Director is limited in its ability to create sophisticated text and graphics, the team searched for other software programs that offered greater design capabilities. They used Adobe Illustrator and Photoshop to create cast members to be imported into Director: creating new, more interesting background fields with textures; adding dimension to screens by using drop shadows for text and images as well as layering graphics and photos; adjusting colors; and, creating beveled edges for buttons. Disturbed by the dramatic difference between no sound on most text screens compared with prominent sound from video and audio clips, they identified a need tto use more sound. They have purchased some royalty free music and are currently in the process of adding soft background music to the modules, especially at transition times. Concerned that the module content was somewhat dry and unmotivating for learners, they created an animated figure of a star with face and limbs, named "Supervisory Superstar". They have incorporated this character, who speaks and performs simple magic tricks, into the modules to call attention to key points, to facilitate transitions within and across modules, and to serve as a guide, offering prompts about navigation throughout the modules. Recently, they have begun to explore the use of the MPEG-1 compression format, which uses an algorithm that enhances the quality of video segments while it decreases the storage space required. As a result, they have decided to convert all video segments to MPEG-1, which will permit full motion video of 30 frames per second at a storage rate of only five (5) megabytes for a 30 second segment; this chage will allow a greater number of video segments to be used in the modules. Now that they have a better idea of storage constraints, they are considering additional ways to take advantage of the interactive properties of hypermedia, including the possibility of offering enrichment units as well as including video case studies at the end of each module as problem solving exercises. They also plan to add a pretest, a mechanism for keeping track of learner responses, and a posttest to determine performance before, during, and after instruction. When the final draft of the modules has been prepared, the developers intend to field test the modules, using supervisors with experience in the WVU practicum program, to get feedback from actual users about the appropriateness of the content and the useability of the programmed formats.

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Conclusion

Multimedia instructional materials represent an important resource for teacher education programs in special education to foster understanding and promote best practice at the preservice or inservice levels. They enable prospective special educators to observe and study many important aspects of professional practice without the time and expense of travelling to and spending time in actual classrooms out during field experiences. They also allow practicing special education personnel to review state-of-the-art practices that may not be currently in operation in their own programs or agencies and can serve as real-life models for the adoption of these innovations. Instructors who are committed to providing the best possible teacher education program for special educators will need to learn to make their own multimedia instructional materials using inexpensive and easy-to-use desktop systems whenever they meed materials that are unique to a particular topic or philosophy or perhaps specific to a particular rural agency or area. With a little equipment, some training, and an investment of time and effort, any individual faculty member or academic program can acquire sufficient, effective, and appropriate multimedia materials to support a teacher education program in special education, whatever their needs, their talents, or their budget.

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